

# UPPER JURASSIC AND LOWER CRETACEOUS MICROFOSSILS FROM THE HAUTES-ALPES

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**ABSTRACT.** Common pelagic (Tethyan) microfossils from the Upper Jurassic and Berriasian rocks of La Faurie, Hautes-Alpes, France, are described and illustrated, and their stratigraphical distribution compared with that of similar assemblages elsewhere. The fossils include crinoids, tintinnids, radiolarians, and *incertae sedis* such as *Globochaete*, *Cadosina*, and *Stomiosphaera*. *Lombardia* Brönnimann is considered to be a synonym of *Saccocomma* Agassiz.

IN the department of the Hautes-Alpes, in south-eastern France, near the village of La Faurie, the Kimmeridgian, Tithonian and Berriasian stages are represented by fine-grained calcareous rocks varying from pure limestones to marls (text-fig. 1). Coccoliths may form a large part of the ground-mass of the rock. In the Kimmeridgian the *pseudomutabilis* Zone and the basal part of the *beckeri* Zone consist of dark marls up to 200 m. thick. Above are up to 100 m. of marly limestone and limestones, with occasional chert nodules, forming the main part of the *beckeri* Zone and of the Tithonian. Conglomerates, probably originating as the result of movement of unconsolidated sediments in mudflows, are common in the Lower Tithonian, and are of extremely variable thickness; they usually give rise to prominent topographic features. The Berriasian is formed of alternating marls and marly limestones.

The beds are sporadically rich in ammonites, including aptychi, and belemnites and brachiopods may occur. The marls below the marly limestones of the *beckeri* Zone and the Lower Tithonian are particularly poor in macrofossils. Microfossils, however, are common in most beds, and various assemblages occur which can be used for correlation locally and which may eventually prove to be useful over a wide area of Southern Europe. References to the forms which occur are widely scattered and illustrations sometimes inadequate so that it has been thought useful to bring them together in one article.

The commonest microfossils are: plates of small crinoids of the family Saccocomidae recovered from washings from marls of the Kimmeridgian and, seen in thin section only, tintinnids such as *Calpionella* and *Tintinnopsella*, radiolarians, and various *incertae sedis* such as *Globochaete*, *Cadosina*, and *Stomiosphaera*.

The specimens figured are deposited in the Hunterian Museum, Glasgow.

Phylum ECHINODERMATA

Class CRINOIDEA

Order ROVEACRINIDA Sieverts-Doreck 1953

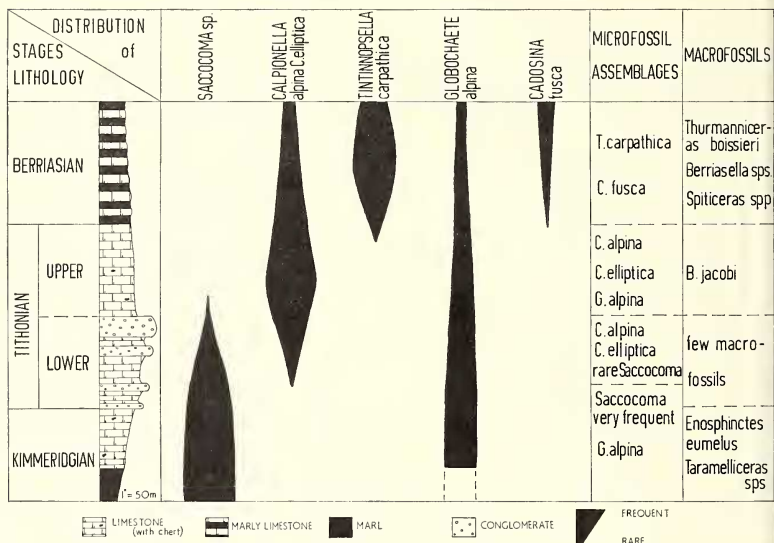
Family SACCOCOMIDAE d'Orbigny 1852

Genus SACCOCOMA Agassiz 1835 [= *Lombardia* Brönnimann 1955]

*Description.* Angular, usually bilaterally symmetrical shapes between  $50\mu$  and  $150\mu$  in length and formed of a single calcite crystal, occur in large numbers in thin sections of the Kimmeridgian and the lowermost Tithonian (Pl. 51, fig. 2). There is now no doubt,

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since the work of Verniory (1954, p. 327), that these are random sections through the brachial plates of small, pelagic crinoids of the family Saccocomidae, although they have been described as various other echinoderm fragments, algae or sponge spicules (Lombard 1938, 1945; Brönnimann 1955). Various types of brachial plates are found in washings of the Kimmeridgian marls which correspond exactly to the description of *Saccocoma* given by Jaekel (1892).



TEXT-FIG. 1. Stratigraphical distribution of microfossils in the Upper Jurassic and Lower Cretaceous of the Hautes-Alpes, France. Specimen numbers refer to catalogue of the Hunterian Museum, Glasgow.

These plates include the first primibrachial, identified by its horizontal proximal facet and strongly oblique distal facet (Pl. 52, figs. 16, 17). This distal facet is joined to the oblique proximal facet of the first secundibrachial, an axillary brachial easily identified by its double distal surfaces (Pl. 52, figs. 20–23). Other plates include unbranched secundibrachials with or without large, delicate, wing-like extensions (Pl. 52, fig. 18). Distal, unwinged brachials of the arms and pinnuli also occur in large numbers (Pl. 52, figs. 24, 25). It is possible to distinguish on some of the brachials the lateral facet from which branched the pinnuli (Pl. 52, figs. 26, 27). Some spined fragments also occur (Pl. 52, fig. 19) very similar to parts of radial plates as described by Verniory (1961, p. 316). All the specimens show a ventral canal and a coarsely reticulate surface.

In 1955 Brönnimann erected the genus *Lombardia*, with three 'species', *arachnoidea*,

*perplexa*, and *angulata*, for various forms found in thin sections in Cuban material. These three 'species' are, as Verniory (1956a, p. 86, see also Dufaure 1958, pl. 6, figs. 1-6) has shown, winged brachials of *Saccocoma* viewed obliquely (Pl. 52, figs. 3, 9) and vertically (Pl. 52, fig. 10) and distal (non-winged) brachials viewed vertically (Pl. 52, figs. 1, 2). *Lombardia* is, therefore, a junior synonym of *Saccocoma*.

Sieverts-Doreck subdivided *Saccocoma* into three morphological groups (1955, p. 119) without giving any new specific names. These groups were characterized by having I. Unspined radial plates, calyx margin straight, proximal brachials without extensions for muscle attachment. II. Spined radial plates, calyx margin straight, with dense or sieve-like plates for muscle attachment. III. Unspined radial plates, calyx margin incurved to cover part of the oral cavity, including *S. tenella* from the upper part of the Upper Jurassic.

She then says that the new species will be described at a later date, but this description does not yet seem to have appeared. Verniory, however, has described one of the forms, with a diagnosis communicated verbally to him by Sieverts-Doreck. He presumably uses the abbreviation *in coll.* (= *in colloquio*) to mean 'in verbal communication'. *S. quenstedti* Sieverts-Doreck *in* Verniory, 1961, is a spined form and thus belongs to Group II. It may be noted here that Verniory's drawing (pl. 1, fig. 7) described as a secundibrachial, is in reality a 1st primibrachial. He also mentions (1962a, p. 390; 1962b, p. 394) a 'groupe *S. schattenbergi* Sieverts-Doreck (*in coll.*)' presumably to include Group I of Sieverts-Doreck, many of the specimens of which are found in the Schattenberg collection, and a *S. feifeli* Sieverts-Doreck (*in coll.*). Characters are given to differentiate these forms from *S. quenstedti*. ICZN Article 13 (p. 13) states that for a name to be available it must be 'accompanied by a statement that purports to give characters differentiating the taxon'. The names *S. schattenbergi* and *S. feifeli* therefore appear to be available, *S. schattenbergi* for a form with thicker radials with long oral projections and *S. feifeli* for a small form with its calyx very flattened axially. It is to be hoped that Sieverts-Doreck's further paper mentioned on p. 119 in her 1955 article will expand these diagnoses and compare these species with other ones previously described.

#### Phylum PROTOZOA

##### Class CILIATA

##### Order SPIROTRICHIDA Bütschli 1889

##### Suborder TINTINNINA Claparède and Lachmann 1858

*Description.* The essential details of the structure and stratigraphical distribution of the tintinnids of the Upper Jurassic and the Cretaceous remain as they were described by Colom (1948, p. 251).

In the La Faurie region *Calpionella alpina* Lorenz and *C. elliptica* Cadisch (Pl. 52, figs. 5, 7) appear in the Lower Tithonian, in beds still containing fragments of *Saccocoma*. They do not, however, become very abundant until the upper part of the Tithonian, where they occur in swarms. The two species continue, with decreasing numbers, into the Berriasian, where they are accompanied by numerous *Tintinnopsella carpathica* Murgeanu and Filipescu (Pl. 52, figs. 4, 8). This form is now known to occur in uppermost Tithonian beds (Colom *et al.* 1954), though its presence in large numbers is usually regarded as diagnostic of the Lower Cretaceous.

Other tintinnids also occur, some of which are of stratigraphical importance, like *Stenosemellopsis hispanica* (Colom) which is frequent, although not confined to the Berriasian, but most of them are rare and therefore of less general use for stratigraphical purposes.

Class ACTINOPODA  
Subclass RADIOLARIA

Large numbers of radiolaria occur at all horizons. The silica of which they were originally formed has very largely been replaced by calcite, but many still retain the form of the porous skeleton and delicate spines of the original structure (Pl. 52, figs. 13, 14, 15).

INCERTAE SEDIS

Genus *GLOBOCHAETE* Lombard 1945

*Globochaete alpina* Lombard 1945

*Discussion.* *Globochaete alpina* (the 'organisme D' of Joukowsky and Favre 1913) is a

EXPLANATION OF PLATE 51

Thin sections photographed in ordinary light.

Fig. 1. *Calpionella* limestone, with *C. alpina* Lorenz (a), *C. elliptica* Cadisch (b); Uppermost Lower Tithonian, Veynes;  $\times 60$ .

Fig. 2. Limestone with *Saccocoma*: sections through winged secundibrachial (c) and distal (unwinged) brachials (d); Lower Tithonian, La Faurie;  $\times 60$ .

Fig. 3. Limestone with *Cadosina fusca* (e) and *Tintinnopsella* sp. (f); Berriasian, La Faurie;  $\times 120$ .

Fig. 4. *Stomiosphaera minutissima* (Colom); Upper Tithonian, St. Julien, X308;  $\times 750$ .

Fig. 5. *Cadosina fusca* Wanner; Berriasian, Veynes, X309;  $\times 750$ .

EXPLANATION OF PLATE 52

Figs. 1, 2, 3, 9, 10. *Saccocoma* sp.,  $\times 150$ . 1-2, Vertical sections through distal brachials, '*Lombardia angulata*' Brönnimann; E3657/1, 2. 3, 9, Horizontal sections through winged brachials, fig. 3 showing the central canal, '*L. arachnoidea*' Brönnimann; E3657/3, 4, 10, Vertical section through winged brachial, '*L. perplexa*' Brönnimann; Lower Tithonian, E3657/5. (Figs. 1, 3, 9, 10, La Faurie, fig. 2, St. Julien).

Figs. 4, 8. *Tintinnopsella carpathica* Murgeanu and Filipescu; Berriasian, La Faurie, P409/1, 2.  $\times 300$ . 4, showing caudal elongation.

Fig. 5. *Calpionella alpina* Lorenz; Upper Tithonian, La Faurie, P410;  $\times 300$ .

Figs. 6, 11, 12. *Globochaete alpina* Lombard; Tithonian, La Faurie; X300. 6, irregular form, X310. 11, quadrilobate form, (a) ordinary light, (b) under crossed nicols to show extinction cross, X311. 12, bilobate form, X312.

Fig. 7. *Calpionella elliptica* Cadisch; Upper Tithonian, La Faurie, P411;  $\times 300$ .

Figs. 13-15. Radiolaria; Berriasian, La Faurie, P1101-3;  $\times 150$ .

Figs. 16-27. *Saccocoma* spp.; Kimmeridgian, beckeri Zone, Vauni  rette, St. Julien;  $\times 50$ . 16-17, *Saccocoma* sp., primibrachials. 16, ventral surface showing ventral canal and horizontal proximal facet where the brachial joined the radial plate, E3654/1. 17, oblique view of dorsal surface showing oblique distal facet, E3654/2. 18, *Saccocoma* sp., secundibrachial, ventral view with broken bases of wing-like extensions, E3654/3. 19, *Saccocoma quenstedti* Sieverts-Doreck in Verniory, spined fragment of radial, E3655. 20-21. *Saccocoma* sp., axillary secundibrachials. 20, dorsal view showing coarse reticulate surface and double distal facets, E3654/4. 21, ventral view showing oblique proximal facet and double distal facets, E3654/5. 22-23. *Saccocoma tenella* (Goldfuss), axillary brachials showing wing-like, reticulate extensions. 22, dorsal surface E3656/1. 23, ventral surface E3656/2. 24-27, *Saccocoma* sp., distal brachials. 24, dorsal view, E3654/6. 25, ventral view with ventral canal E3654/7. 26, dorsal view of brachial with base for pinnule, E3654/8. 27, ventral view of brachial with base for pinnule, E3654/9.

